this question. And, so far, it has not been answered.

(2) A conception of quite a different nature is presented in the book by Dr. Roussy and his colleagues on the treatment of the psychoneuroses of war. Their work deals chiefly with those "accidents d'ordre hystérique" which they describe as the most important of the psychoneuroses observed during this war. A comparison of their book with such a treatment as Dr. MacCurdy's in "War Neuroses" (recently reviewed in these columns) provokes the reflection that a wider conception of the war psychoneuroses than that held by these French authors seems to be necessary if medical science is to learn all it can from the experiences of war psychotherapy. The book deals with the causation, treatment, and prophylaxis of these hysterical disorders, and discusses the recent "reflex," "dynamogenic," and "dyskinetic" theories of their nature. It is clearly written and excellently illustrated.

OUR BOOKSHELF.

Memoirs of the Boston Society of Natural History. Vol. viii. No. 3. *Monographs on the Natural History of New England. The Turtles of New England.* By Dr. Harold L. Babcock. Pp. 327–431 + 16 pls. (Boston, Mass.: 1919.)

This is a very interesting and excellently produced monograph dealing with seventeen species out of sixty-one now recognised by American authors. Considering that New England includes the northern limit of distribution of the Chelonians of eastern North America, this is a good number. The author has collected most of the observations published on the life-histories of these species, and such a compilation is a valuable addition to the descriptive and iconographic part of the work.

Objection may be taken to the title of the monograph, as the term "turtle" is usually taken to apply to thoroughly aquatic Chelonians only. As the author tells us, it has been suggested that (1) all Chelonians of the land only should be called tortoises; (2) all Chelonians of fresh water should be termed terrapins; and (3) all Chelonians of the sea should be called turtles. It is somewhat difficult to draw a limit between the two first categories, and one does not quite like the name "terrapin" to be bestowed on the soft-shelled or river Chelonians, the Trionychidæ. Perhaps these might be termed river-turtles in opposition to sea-turtles.

The descriptive part is preceded by an introduction, in which the author deals with Chelonians generally. Three statements call for criticism. (1) The skull is stated to be more solid and compact than in other reptilian orders; but what about crocodiles? (2) Some marine turtles are said to be strictly herbivorous (p. 330); this can only be meant to apply to the green turtle (*Chelone mydas*), which is chiefly, but not exclusively, so; and further on (p. 340) we are told of a specimen in captivity greedily taking large pieces of raw fish. Among the terrapins, *Batagur* and *Dermatemys* are also chiefly herbivorous. (3) Speaking of the longevity of land tortoises, instances of existence for much more than a century might have been given; and to the statement that Gilbert White's famous tortoise (*Testudo ibera*) lived nearly sixty years, "in capitivity" should have been added. A still better record for the same species is furnished by an individual, on which the writer of this notice has reported, that has been kept in Cornwall for ninety-six years.

G. A. B.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can be undertake to return, or to correspond with the writers of rejected manuscripts intended for this or any other part of Nature. *No notice is taken of anonymous communications.]*

Luminous Worms.

The Rev. Hilderic Friend in his letter to Nature of August 7 (p. 446) asks: "Is it possible that light can influence Annelids in some way, and so facilitate sexual processes?" He cites the affirmation of Flaugergues made in 1771 that luminosity disappears in certain cases after copulation.

There is the other way of approaching the subject. We know that the luminous earthworms, with which Dr. Gilchrist has dealt in his recent paper, can be stimulated to luminesce; so may we not ask: Is it possible that sexual processes may facilitate the excretion of the substance or substances to which luminosity is due?

We are acquainted with the fact that in other invertebrate groups muscular contraction, due to a stimulus to the nervous system, will expel the contents of glands secreting the substances essential for the production of light. For example, we know that sometimes excitement due to the attack of enemies will cause phosphorescence in centipedes (Thomas, cited by Dahlgren, Journal of the Franklin Institute, January, 1917, p. 85 of reprint). In a forthcoming paper Dr. Brade-Birks and I shall indicate several other ways in which the same result can be brought about among the Chilopoda.

A careful reading between the lines may show that fear, shock, *and sexual processes* each provide the stimulus to the nervous system which results in the expulsion of the essentials of luminosity by a contraction of the muscles in the case cited by Mr. Friend, and that if that stimulus were sufficient to exhaust the store of secretion the animal mentioned by Flaugergues would, of course, fail to exhibit luminosity again until the secretion had had time to re-accumulate.

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The National Union of Scientific Workers and Research.

One of the chief aims of the National Union of Scientific Workers is "to secure adequate endowment for research and to advise as to the administration of such endowment." A committee of active workers in all the principal subjects has been appointed to consider methods of carrying out this object. While the committee is agreed upon the general aim of making

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it possible for the scientific worker to make research his profession (subject, of course, to efficiency), concrete suggestions regarding methods of achieving this are essential; and as the committee is a comparatively small body it cannot expect to be acquainted with all the relevant facts concerning the conditions under which research is conducted at present. To overcome this difficulty it is proposed to associate with the committee a number of advisory panels consisting of persons in the principal research centres in the British Isles. Will those workers (whether already members of the Union or not) who would be willing to supply the information required, or to make definite suggestions concerning possible methods of improving these conditions, please communicate with the undersigned or some other member of the committee?

The present committee consists of the following:—Dr. O. L. Brady (Chemistry, Imperial College), Dr. J. W. Evans, F.R.S. (Geology, Imperial College), Mr. W. F. Higgins (Experimental Physics, National Physical Laboratory), Dr. A. Holmes (Geology, Imperial College), Dr. H. Jeffreys (Mathematical Physics, Cambridge), Dr. F. Kidd (Plant Physiology, Cambridge), Dr. M. C. Rayner (Botany, General Branch), Dr. C. Shearer, F.R.S. (Zoology, Cambridge), Mr. E. Sinkinson (Chemistry, Imperial College), Dr. C. West (Plant Physiology, Imperial College), Miss D. M. Winch (Pure Mathematics, Cambridge).

HAROLD JEFFREYS.

St. John's College, Cambridge.

WIRELESS NAVIGATION FOR AIRCRAFT.

THE determination of the position of ships at sea involves dead reckoning and the use of sights on terrestrial or celestial bodies. Dead reckoning methods often give fairly accurate results, even when no sights can be taken. With aircraft, however, drift plays so large a part that dead reckoning methods are not sufficiently trustworthy. Hence the necessity for other methods for determining position.

Directional wireless gives a means of finding one's position under almost any conditions, and thus enables navigation to proceed in cases where it would otherwise be dangerous, such as in fog. It uses chiefly the well-known property of loops, that if the plane of a loop makes an angle θ with the direction of propagation of the waves, the E.M.F. produced in the loop is $E_0 \cos \theta$. The rate of variation of this with θ is greatest when $\theta = 90^\circ$, *i.e.* when the signal strength is a minimum, and bearings have hitherto been obtained by turning the loop until the minimum is obtained.

There are two distinct ways in which this navigation might be effected:—

(1) The aircraft should emit ordinary wireless signals and directional stations on the ground determine various directions of the aircraft, the central ground station working out the position of the aircraft and re-transmitting it to the aircraft. This method has been used considerably by the Germans.

(2) There should be ordinary transmitting stations on the ground which should transmit ordinary wireless signals, and the aircraft should determine bearings of each of these known ground stations, the navigator working out his position from these bearings. This method has very many obvious advantages over the first method, such as the fact that an unlimited number of aircraft can work out their own positions at the same time, and also the fact that in case of warfare the position of the aircraft need not be disclosed to the enemy. This second method was adopted in the R.A.F. to a great extent.

In attempting to place directional gear on aircraft there were considerable difficulties:—(1) There is much extraneous noise on aircraft; (2) the space available on aircraft is not abundant, and in any case it is not easy to get large loops; (3) the possibility that the waves would be deviated in the neighbourhood of the aircraft, thus producing errors which would have to be determined.

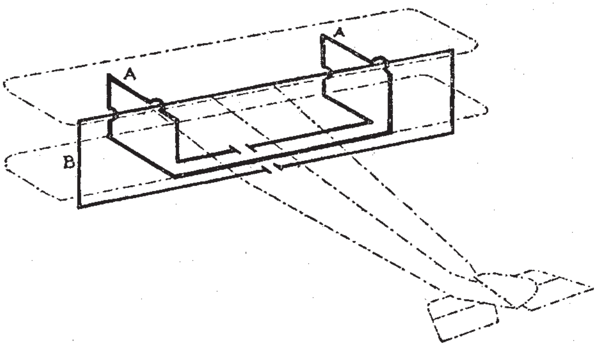

FIG. 1.—A, main aerial; B, auxiliary aerial.

It was obvious that the best amplification of signals that could be obtained would have to be used. Even with the best amplification known, it was found that the extraneous noise was so considerable that the ordinary minimum method of using a loop aerial to find direction was of very little use. Because of the extraneous noise the minimum was considerably widened, and even with powerful signals there might be a region as large as 40° to 60° where no signals at all were obtained. It was hence necessary to devise some method by which signals could be heard whilst the bearing was taken. For this purpose the following method was devised:—

Two loops at right angles are used. These loops are rigidly fixed together and rotate round the same vertical axis. When one of these loops is on its maximum the other will be on the minimum. When the maximum or main coil is used alone, the maximum of the signals is first roughly obtained, and then the second or auxiliary coil is introduced, the connections of this second coil being reversed from time to time. If the main coil is on its maximum the reversal of the auxiliary coil will not alter the strength of the signals, but if the main coil is not correctly on the maximum the reversal of the auxiliary coil will give signals of different intensity; hence the method to employ is to rotate the coils, using the main coil alone until somewhere near the maxi-

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